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The impacts of "Land of Love, Water Cellar for Mothers" in western China

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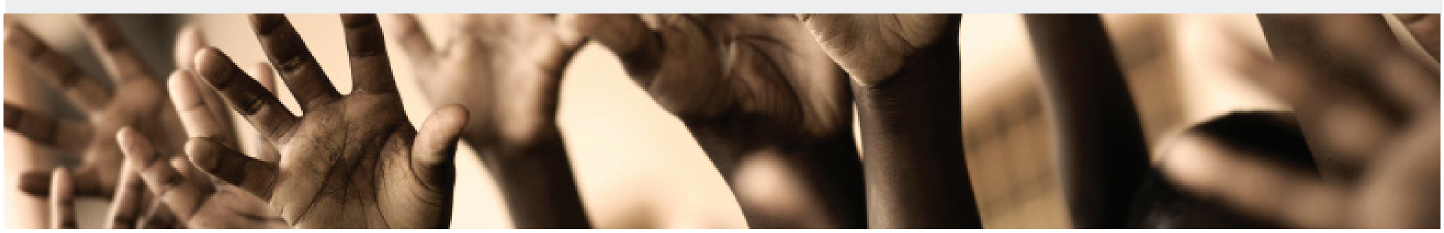

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Abstract

In this study, we estimate the impacts of the "Land of Love, Water Cellar for Mothers" project that was launched to address comparatively serious water scarcity in western China. In these areas, male labourers flock to cities as a result of China's social transformation, leaving women as the main workforce in the poverty- and drought-stricken countryside of the region. We conducted two waves of a household survey: one prior to installation of a water storage facility referred to as a "water cellar" and a second wave after installation. In this paper, we first present theory of how the effects of the water cellar project are transmitted and then we empirically estimate the impact of project. We show that the water cellar project increases household incomes by an average of 4.6%. The water cellar project also significantly increases women's on- and off-farm labour supply. The water cellar project is not shown to lead to a statistically significant impact in children's school attendance or household health conditions.

Key Words: C23; J22; Q25

JEL classification: Water cellar, Western China, Drought

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I. Introduction

Water shortages are a major worldwide issue. Many parts of western China experience frequent drought, and more than 20 million people are seriously affected. On average, residents use only around 110 cubic meters per person, roughly 15% of the national average and 3% of the world average. The lack of water causes hardships in life. It reduces agricultural production, affects the health and education of local farmers and leads to poverty. For example, in many villages facing water shortages, annual per capita income was less than 1,200 RMB (176 USD) in 2005.

Male labourers flock to cities as a result of China's social transformation, leaving women as the main workforce in the poverty- and drought-stricken countryside. Among women's many burdens, long daily trips to fetch water are notable. Thus, they have very limited time for other activities, and are generally preoccupied with too many other activities to migrate to cities as their husbands do. Water shortages particularly impact the ability of women to work outside of the home. Serious water shortages also introduce health problems to women. For instance, the lack of water supplies leads to poor hygienic conditions and therefore may induce gynaecological diseases. Serious water shortages also contribute to high malnutrition rates among children and their elevated school dropout rates. Many children miss school as a result of their water carrying burden.

In order to help people to shake off poverty due to water shortages, with a focus on women, the China Women's Development Foundation (CWDF) carried out a project named the "Land of Love, Water Cellar for Mothers" project, under the guidance of the All-China Women's Federation (ACWF). The project was launched in 2000. These "water cellars" are a kind of water storage facility in northwestern rural China. Usually built underground, the water cellar looks like a jar or water vat and serves to accumulate rain and other usable water for people and for livestock. Collecting rainwater is the most economical and practical way to ameliorate the situation with respect to water shortages.

The project raises charitable funds for farmers to build water cellars to collect rainwater. More importantly, the project involves technicians and water resource experts who design water storage facilities (hereafter referred to as "water cellars") and build small water supply facilities which connect these cellars with pipes. To date, the project has financed more than 130,000 water cellars and a further 1,500 small water supply facilities at the village level. Water cellars for mothers benefit women by efficiently supporting their primary responsibilities in the house and on the farm, by improving their health, and also by making it easier for them to pursue career development through off-farm work or by setting up their own business. By helping women and their families, the beneficiaries of the water cellar project include about 0.8 million farmers.

The past 30 years since China began carrying out the reform and opening-up policy have witnessed a marked buildup in China's overall national strength. Coastal areas in eastern China have made great progress in their development over two decades of unremitting efforts. The industries there, especially traditional industries, are almost saturated. They are eager to locate new markets, while the western regions are urgently in need of development. To ensure a fast, healthy and sustainable development of the national economy, the Central Committee of the Communist Party of China and the State Council of the People's Republic of China made the important strategic decision at the beginning of 2000 to implement a plan to expedite the development of the western regions. A leading group composed of the Premier, Vice Premier and 19 ministerial-level officials, was established for Western Development under the State Council.

Among China's many western poverty reduction projects, the "Land of Love, Water Cellar for Mothers" project is the only one that directly benefits women. Although the project has been in action over 8 years and has attracted much attention, to date no concrete analysis has focused on the impacts of the project. In particular, no studies have focused on the causal effects of the water cellar project. Namely, it is not clear by how much households' incomes rose due to the water cellar project, how many labour hours are saved due to the water cellar project, and whether there are and the extent of health effects of water cellar project activities.

In this study, we rigorously review the impact of the project on health and rural poverty in the areas seriously hit by water shortages. In particular, we evaluate the effects of building water cellars on women's income and health conditions. We also explore how the project promotes off-farm work among women, along with their migration to cities and/or setting up of their own business. Moreover, we study how the impacts depend on local conditions (such as local transportation). Our study provides an in-depth evaluation of the project. Our study therefore supports efforts by governmental policy makers and other NGOs to understand how women play the role that they do in poverty reduction. Furthermore, our research helps policy makers and NGOs figure out how they could do better and what they should do next with the goal of getting rid of poverty in western China. Our study advises policy makers in their implementation of China's national strategy of western development that benefits more than 32 million of the poorest in the country.

Our study is an early contribution to research on the impacts of the water cellar project. In fact, there are many government-funded and NGO-funded poverty reduction projects in China, but to date there has been limited research which evaluates their impacts on poverty reduction. In order to estimate the impacts of the water cellar project, we conduct two waves of a survey. The first wave of the survey was done before installation of the water cellars and the second wave was done after installation. The installation of the water cellars determines whether the sampled households are placed in the control group or the treatment group.

We then adopt the difference-in-differences method to estimate the impacts of the water cellar project. We show that the water cellar project increases average household income (4.6%) and off-farm income (3.1%) in the treatment group. Moreover, these projects strongly and positively impact both on- and off-farm labour supply. Finally, the results also show that water cellar projects do not significantly increase children's school attendance and do not improve households' health status.

The rest of the paper continues as follows. We present our literature review in part 2. We then show how the theory of how the effects of the water cellar project are transmitted in part 3. The basic statistics are presented in part 4. The empirical analyses are given in part 5. We conclude in part 6.

II. Literature review

Most of the literature on policy evaluation tends to treat the application of policy as binary. For instance, there are many studies on job market training programs. This literature could be traced back to Ashenfelter (1978) and LaLonde (1986). In such settings, a number of individuals either do or do not enroll in a training program, while the main labour market outcomes of interest are annual earnings and employment status. Most research on this topic aims to identify average treatment effects. For instance, on average, how much does the job market training program being studied increase participants' salaries. More recently, many studies on this topic focus on quantile and distributional treatment effects. For instance, the reader may wish to refer to Bitler, Gelbach and Hoynes (2006); Hansen (2005); Attanasio, Meghir and Santiago (2005); Behrman and Todd (1999); Schultz (2004); Todd and Wolpin (2003) and Djebbari and Smith (2008).

Numerous studies have focused on the health effects of water and sanitation projects. For instance, a number of studies have found that access to safe water is associated with better children's health (Merrick, 1985; Behrman and Wolfe, 1987; Esrey et al., 1991; Lavy et al., 1996; Lee et al., 1997; Jalan and Ravallion, 2002). Galiani et al. (2005) study the impact of the privatization campaigns of water companies in Argentina on child mortality, and find that child mortality fell by 8 percentage points in areas that privatized their water services; and that the effect was largest (26 percentage points) in the poorest areas.

A fair number of previous works have studied the income effects of water and sanitation projects. For instance, Bathia and Falkenmark (1993) and Namara et al. (2010) investigate the link between water management and poverty. Rosegrant and Meinzen-Dick (2005) review the management of water resources in the Asia-Pacific region for countries with significant irrigated areas: Cambodia, China, Indonesia, Korea-DPR, Republic of Korea, Laos, Malaysia, Mongolia, Myanmar, Philippines, Thailand and Vietnam. They show that most water resource projects in the Asia-Pacific region significantly improve farmers' access to water for agricultural purposes and therefore increase farmers' household incomes. For the case of China, Wang et al. (2005) study the effect of water management reform in China. They explore how the new water management programs affect agricultural production, farmer income and poverty in China's Yellow River basin. They show that the programs do not significantly impact farmers' incomes or agricultural production.

Although there is plenty of literature focusing on the link between water supplies and poverty reduction, our study brings this literature forward in the following respects. First, our study provides clear causal evidence that better access to clean water significantly increases household income. Secondly, the quality of the sample used for this study is amenable to a comparatively rigorous identification strategy; this identification strategy allows us to avoid the estimation bias associated with a within-subjects estimate of the treatment effect and a between-subjects estimate of the treatment effect. Besides the contributions in identification strategy, our project also provides a clear result with policy relevance, namely, that the water cellar project effectively reduces poverty in the dry areas of western China.

III. The Water Cellar for Mothers project

The Water Cellar for Mothers Project relies on donations to fund farmers to build water cellars for the purpose of collecting rainwater. By the end of 2012, the Land of Love, Water Cellar for Mothers Project had been carried out in 24 provinces, building more than 130,000 water cellars and 1,500 village-level water supply systems, and benefiting more than 1.9 million people with a project implementation scale of more than 600 million RMB (96.5 million USD).

The project is implemented as follows. The China Women's Development Foundation (CWDF) regularly holds campaigns to collect donated monies. CWDF then selects villages to implement the project according to the degree of water shortage or according to the willingness of donors. Depending on the local conditions, the technicians determine whether to build rainwater-collecting cellars for each family or to build a small centralized water supply works for every village. Before the construction of water cellars, CWDF finds supports from local governments and collaborates closely with governmental organizations. In addition, CWDF involves both women's federations at all levels and women in rural areas in the participation of construction and management of water cellars. Furthermore, in order to ensure donor confidence, all-round supervision and on-the-spot inspection by donors is permitted.

IV. A theoretical framework for understanding transmission channels of impacts of the water cellar project

The theoretical framework will help us understand how the effects of the water cellar project are transmitted. Among all those research questions, the question which interests us most is the extent to which the water cellar project is linked to increased household income. This also leads us to look into other related issues. For instance, the water cellar project reduces the amount of time that women spend getting water and therefore make it more feasible for them to work outside the home, and thus it is unsurprising to find evidence of increases in their household income.

To better understand this question, we construct a very simple model to make the transmission channels of the impacts of the water cellar project explicit. We first decompose household income into off-farm income, agricultural income and other sources of income (government transfers, investment income) as follows:

Household income = agricultural income + off-farm income + other source of income (1)

The water cellar project is supposed to affect household incomes by either increasing agricultural income or off-farm income. For instance, water collected by water cellars may increase agricultural production by increasing crop yields and livestock yields resulting in increased agricultural and off-farm income. We assume that farmers are price takers, both in agricultural product markets and in labour markets. Therefore, we have:

Household income = (price)(agricultural production) + (wage)(labour spent in off-farm work) + (other source of income) (1')

As for agricultural income, if we take crop and livestock prices as being fixed, then we will primarily be interested in the level of production of crops and livestock. Equation (2) specifies the production functions of crop yields and livestock yields.

Agricultural production = f(water usage, labour in agriculture, other factors) (2)

where the other factors in the equation include the amount of farmland, fertilizer usage and whether the area is hit by natural disaster. We do not find these factors to be affected by the water cellar project. However, the water cellar project affects both the amount of water and the amount of labour applied to agricultural production. For instance, the water cellar project (small water facility at the village level) is linked to increased use of water for agricultural purposes; also, farmers have more time available while increased water supply allows them to extract further value out of labour dedicated to agricultural processes.

As for non-agricultural income, it is also positively impact as a result of reduced time spent fetching water, as a result of the water cellar project. For instance, in many cases they could potentially use this time to work in a nearby city or will in some cases allocate extra time to a new or existing small business. Hence, the water cellar project will increase household income by either directly increasing water resources flowing into agricultural production and/or by allowing farming households to reallocate time previously expended fetching water for agricultural or non-agricultural purposes. The water cellar project affects both their labour allocation and the total number of labour hours. For instance, the water cellar project may enhance farmer's health conditions (through reduced contraction of both waterborne and non-waterborne diseases) and provide them with opportunities to develop labour skills with some of their time freed up by the project. All in all, the water cellar project allows farmers to put more labour into agricultural production activities as well as other off-farm work. Thus, we present equation (3) on water usage and equation (4) on total household labour supply:

Water use in agriculture = h(water cellar project, other sources of water) (3)

Total labour supply = k(water cellar project, family size, number of children, water borne disease, non-water borne disease, age) (4)

The waterborne disease in equation (4) varies as a function of the water cellar project. As we mentioned before, despite the lack of any strong statistical relationship, we believe it is reasonable to assume that the water cellar project can improve farmers' health conditions by reducing their risk of suffering waterborne disease. Total labour supply in the above equation provides a representation of how we can understand labour allocations between agricultural and off-farm work. We assume that households are rational enough. Therefore, they decide whether to allocate their labour to agricultural work off of household farmland, mainly depending on the returns in these areas of work. We assume decreasing marginal returns to labour in agriculture and constant returns in aggregated off-farm labour markets (i.e. a constant wage rate); in equilibrium, the marginal returns of both types of labour should be equivalent. Obviously, the marginal returns to labour in agriculture depend on other production inputs on the right-hand side of equation (2), i.e., agricultural labour inputs are specified as a function of agricultural inputs, wages and total labour supply. Off-farm labour is equal to total labour supply minus labour in agriculture. We then have:

Agricultural labour = l(water usage, other agricultural production input factors, wage rate, total labour supply) (5)

Off-farm labour = (total labour supply) - (labour in agriculture) (6)

We substitute (4) into (5) and then (2), (4) and (5) into (6). It should then be fairly easy to see that total household income is affected by the water cellar project and other factors. The survey suggested in this paper allows us to collect information on all of the variables in equations (2) through (6). Having estimated equations (2) through (6), we can then identify the channel through which the water cellar project increases household income.

Besides increasing household incomes, the water cellar project may also induce more children into schooling which in some cases will mean that the overall income effect in the short or medium term is likely to be negative in a fair number of cases. The most obvious factor here is that the water cellar project makes it easier for children who have previously been involved in fetching water for household purposes to instead go to school.

V. Data collection and basic statistics

Given the pool of project villages in the year 2010, we randomly select 8 water cellar project villages in Ningxia Hui autonomous region using a village administration household list. The reason for choosing Ningxia Hui autonomous region is that many parts of this region suffer some of the most severe water shortages in China. The region is located in north western China. The region is 1,200 kilometres from the sea and has a continental climate with average summer temperatures rising to 17 to 24°C (63 to 75°F) in July and average winter temperatures dropping to between □7 to □10°C (19 to 14°F) in January. Seasonal extreme temperatures can reach 39°C (102°F) in summer and □30°C (□22°F) in winter. The diurnal temperature variation can reach above 17°C (30.6°F), especially in spring. Average annual rainfall in the region ranges from 190 to 700 millimetres (7.5 to 27.6 in), with more rain falling in the south of the region. Therefore, we can say that the north of the Ningxia region is seriously hit by water scarcity, and that the occurrence of drought is comparatively frequent.

The 8 project villages in our sample are all located in northern Ningxia. In these project localities, the water cellars were installed for most households in 2010. We surveyed households in 8 project villages. For each project village, we use the nearest non-project village as a statistical control. Therefore, we have a total of 16 villages in the sample: 8 in the treatment group and 8 in the control group. The reason to choose control group villages this way is in the hope that the geographically nearest village will have comparatively similar conditions to project villages (such as local transportation, local geographical characteristics and local bureaucracy) which affect the ways in which water cellars impact household income. Therefore, for each project village, we chose a nearby non-project village to serve as a statistical control for the project village. This allows us to study how the impacts of the water cellar project vary according to local conditions. We first determine the number of surveyed households in the villages in the treatment group, and then accordingly choose the same number of surveyed households for the villages in the control group. The number of surveyed households in each village varies from 40 to 100 depending on the size of the randomly chosen villages. For the villages in the treatment group, the size of 40 to 100 surveyed households guarantees that at least 25% of households in each village were chosen for the survey. We then have 580 households in each of the treatment and control groups, for a total of 1160 households in our sample. To summarize, we first randomly choose 8 project villages among project villages in the Ningxia region in 2010. We then use the geographically nearest village as the control village. For all villages, we randomly choose households using the household list provided by village offices.

A question which naturally arises here regards the representativeness of our samples. Given that our study wants to shed light on the impacts of water-related policy interventions, we want our study to advise policy makers on how they could do better in order to address the poverty associated with water scarcity. To this end, our study focuses on the areas that are most strongly hit by water scarcity. After consulting with CWDF, most water cellar projects have been focused in north western and south western areas of China. In particular, more than 70% of project areas are located in the northwest (Shaanxi, Shanxi, Ningxia, Xinjiang and Qinghai). This area accounts for one-third of the territory of China and 90% of the surface area of China that suffers water scarcity. Average annual rainfall in the northwest is around 300-400 millimetres. The five regions have similar geographic and climatic characteristics and have a similar level of economic development (per capita GDP in 2010 ranged from 18,346 to 20,779 RMB and they are among the poorest regions in China). Therefore, although our survey only involves villages in Ningxia, we feel that these villages are typical of the northwest of China. The reason that we chose the Ningxia region as our study area is that Ningxia is fairly similar to the four other regions which commonly experience drought in northwest China. We hence expect that if the water cellars work for those project villages, they could work for other villages in the regions too. The 8 project villages have been randomly chosen from CWDF project villages in Ningxia. Our sampling is not strictly random, but we have tried our best to avoid any source of sampling bias. After choosing the project villages, for each project village we randomly choose a nearby non-project village to pair with the project village. We then randomly sample individual households from the villages. Moreover, the sampling bias due to village choice could be partially fixed when we control for local village conditions. This helps us understand how the impacts of water cellars vary by local geographic and bureaucratic characteristics. With that analysis, we can then judge whether and how the water cellar project goes to work for the villages.

Another question arising here is whether our sample size is sufficient to capture the effects of the water cellar project. In other words: is our sample size large enough to capture the effect of the water cellar project? We will conduct the power analysis to test this after presenting the basic statistics of the first wave of the survey.

We designed the 6-section questionnaire. These sections involve the basic demographic Information of each household member (including their age, gender, working status and years of education), the size and incomes of households' own farmland and livestock (i.e. the incomes from farming and livestock), incomes from off-farm work, other income sources and labour allocations, children's education and the health status of each household member. We also collect basic information on village characteristics such as the distance of the village to the closest water resource, the distance to the closest major city and the distance to the closest highway. For key variables such as income and labour allocations, we design our questionnaire to decompose income as follows: income from farming, income from off-farm activities and other sources of income. To determine farming income, the survey collected information on the amount of crop production from farming activities, the sale price of crops produced and the cost of planting crops. As for the income from off-farm activities, we ask for the off-farm income of each household member. Total income is then the sum of the three types of income sources. For the labour allocation, we ask for the average number of hours worked per day by each household member. The reference period is the 12 months prior to the survey.

Given the characteristics of our data, we will adopt the difference-in-differences identification strategy to estimate the impact of water cellar projects. We conducted two waves of the survey: one in August 2010 and one in August 2011. Households in the treatment group had water cellars installed in 2010 whereas households in the control group had not had water cellars installed by August 2011, by the time of the second wave of the survey.

The first wave of the survey was performed in August 2010. The main difficulty we have encountered in household surveys is that household heads often immigrate to cities to work. Therefore, we often could not interview them directly. As an alternative, we interview the partner of the household head. Sometimes, we could not meet the wife either. In these cases, we revisited the household. In cases where the households are not present for inclusion in the second round of the survey, we repeat the same random process (selection from village administrative lists) to replace households in the survey. For each interview, we ask our interviewers to evaluate how interviewees cooperate during the interview. If they are evaluated as being uncooperative, we revisit the household or interview an alternative household. There are some missing values in our survey. We do not think this happens systematically. We do not believe the missing values introduce bias to our sample, so we simply treat them as missing values. There are some seasonal effects on interviewees' income, especially for those who get their main income from farming work. In order to help avoid seasonal effects, we thus ask for household annual income. We also ask whether a natural disaster occurred. No natural disaster occurred in our sampled villages in the year preceding the first wave of the survey.

The second wave of the survey was done one year after the first wave. Some difficulties were encountered in relation to contacting some interviewees from the first wave of the survey, including even being unable to locate the household members. This led to some instances of missing values in the second wave. In our empirical analysis, we omit observations with missing values. A question on the selection of our control group is whether households in the control group had water cellars equipped by the time of the second wave survey. When we took the first wave of the survey, we verify whether households in the control group do not have water cellars equipped. When we took the second wave of survey, three villages in the control group had begun to implement the water cellar projects. However, no operational water cellars were present at the time that we ran the second wave of the survey. Therefore, we believe that our control group is valid.

The data collected from questionnaires is our sole source of data. Table 1 provides the basic statistics of the data gathered from the first wave of surveys. We also present the pairwise comparison (see appendix) of the sample mean and standard deviation of the 8 project villages and the 8 control villages, for each variable. These comparisons allow us to study whether the mean and distribution of the variables that we are interested in differ between the treatment and control groups prior to installation of the water cellars. Thus, we can determine whether differences between the control and treatment groups can be ascribed to the water cellar project. The data we gathered involves several aspects of household characteristics, such as the number of household members, the age composition of household members, total household income and the composition of income (on- or off-farm). We also gather the data on household water demand for agricultural and daily household uses. The data also includes household health conditions.

Table 1: Basic statistics from first wave of survey

Variable list	Mean		
	Treatment group (st. dev.)	**Control group (st. dev.)**	**Total (st. dev.)**
Number of household members (persons)	5.81 (1.93)	5.68 (1.97)	5.74 (1.95)
Household members over age of 60 years (persons)	0.66 (0.84)	0.68 (0.85)	0.67 (0.84)
Household members under age of 16 years (persons)	2.21 (1.39)	2.14 (1.41)	2.17 (1.39)
Household members with high school education or above (persons)	0.99 (0.91)	1.03 (0.92)	1.01 (0.92)
Household members with health insurance (persons)	0.86 (0.35)	0.89 (032)	0.87 (0.33)
The size of household's farmland (mu (15mus=1ha))	13.11 (12.25)	11.99 (10.53)	12.55 (11.43)
Net income from farming (RMB)	1695.46 (800.44)	1710.85 (804.94)	1702.81 (802.38)
Net income from livestock (RMB)	600.36 (972.87)	636.41 (1036.35)	633.38 (1002.74)
Net income from own business (RMB)	29.98 (140.78)	20.03 (131.29)	25 (136.04)
Income from off-farm work (RMB)	1944.32 (1304.32)	1926.39 (1424.99)	1935.36 (1364.48)
Household net income in the past year	4270.14 (2075.42)	4293.95 (2161.04)	4282.05 (2117.76)
The distance to fetch drinkable water (km)	1.21 (3.67)	1.34 (4.13)	1.28 (3.98)
The use of drinking water (tons/month)	5.2 (11.26)	4.93 (10.27)	5.06 (10.35)
Total cost of planting (RMB, including seeds)	789.23 (1672.31)	855.79 (1532.18)	822.51 (1722.65)
The use of water for agricultural purposes (tons/year)	150.28 (246.89)	138.47 (258.79)	144.38 (275.43)
The cost of water for agricultural purposes (RMB)	256.41 (359.26)	218.23 (370.88)	237.32 (342.38)
The distance to fetch water for agricultural purposes (km)	1.05 (4.23)	1.58 (4.56)	1.32 (5.18)
Total number of livestock raised (pig, cow and sheep)	10.26 (21.64)	8.75 (20.38)	9.51 (23.65)

Total number of livestock raised (rabbit, chicken, duck and goose)	15.27 (25.46)	13.29 (23.49)	14.28 (27.54)
Total labour hours spending fetching water (household head and wife, average)	1.63 (2.37)	2.04 (2.85)	1.84 (3.06)
Total labour hours spending on fetching water (children)	1.12 (2.64)	1.26 (1.98)	1.19 (2.54)
Whether all children attend primary and middle school (yes)	65%	58%	62%
Whether wife decides where to immigrate? (yes)	35%	42%	39%
Whether wife decides to buy durable good? (yes)	56%	48%	52%
Whether wife decides to send children school? (yes)	35%	42%	39%
Whether husband engages in taking care children? (yes)	10%	5%	8%
Household members contracted hepatitis or cholera or dysentery or typhoid (yes or no, %)	0.43 (0.5)	0.39 (0.49)	0.41 (0.49)

Source: Survey conducted by authors and local team

These statistics are presented for the treatment group in column 1, for the control group in column 2 and for the combined dataset in column 3. Average household size is 5.74 persons. Average household size is greater in the treatment group than in the control group, but the difference is very small. Household age compositions (number of adults, children and elderly) in the treatment and control groups are also very similar. The average number of persons who are educated at or beyond the high school level is rather low, at less than 1 per household. Only an average of 0.87 in 5.74 persons in each household has health insurance coverage. The average household has total farmland holdings of less than 1 ha (1 ha=15 mus). Households most often earn more income off of the farm than on it. Average reported household income in the previous year was 4272 RMB (roughly 700 USD), one-fourth of the national average. The government of Ningxia states that the average income of farmers in the villages is somewhat higher, at 4628 RMB. This is because both project and non-project village are relatively drought-ridden and are in general less developed than most villages in Ningxia.

Household heads reported that they and their partner each averaged 1.84 hours per day fetching water while children spent an average of 1.12 hours per day collecting water. The decision of whether to immigrate is most typically made by the household head, while women are more engaged in taking care of their children. As for the decisions to send children to school or to buy durable goods, the household head and wife decide this jointly. Moreover, an average of 0.41 in 5.74 household members contracted hepatitis, cholera, dysentery or typhoid in the previous 12 months.

Here, we present some basic statistics to give an indication of the explanatory strength of our data. As we mentioned before, here we present the power analysis of whether our sample size effectively captures the impact of the water cellar project. For example, we have average household income of 4282 RMB per month and a standard deviation of 2118. We respectively assume that water will increase the household income by 15%, 10% and 5%. We then run the power test. The test respectively requires 113, 258 and 1028 households in the sample at the 90% confidence level. Hence our sample size is large enough to capture a 5% income increase effect. After consulting with the project leaders, we are confident that the impact of water cellars should be a more than 10% increase in household income. We also conducted a power test to determine the intra-village cluster effect. To do that, we have an average village sample size of about 147 RMB. We also select an alpha of 10% (90% significance level). We determine the standard effect size (the effect size divided by the standard deviation of the variable of interest). Our baseline survey indicated that average household income is 4282 RMB, with a standard deviation of 2118. To evaluate whether there is an effect size of at least 10%. The standard effect size is then 428/2118=0.202, for a cluster power test at the 90% confidence levelfor the cluster size. We need more than 49 clusters (villages) for this level of confidence, whereas budget constraints dictated that we could only get data from 16 villages.

A question which naturally arises here is whether there are differences in the mean and variance in the values of key variables in the treatment and control groups. If there are, it would be difficult for us to identify the impact of the water cellar project even if we do observe differences between the treatment and control groups in the second wave of the survey. In the appendix, we present the test for whether there are systematic differences in the means of those variables between the treatment and control groups. The corresponding F-test is also presented, as are the Kolmogorov-Smirnov statistics and the Wilcoxon signed-rank test (to help us judge whether the two samples are drawn from the same dataset, i.e., whether they have a different distribution). As we mentioned before, for each village in the treatment group we pick a nearby village as a control for a total of 8 pairs in our tests. Therefore, each of these tests are performed with respect to each variable for each of the 8 pairs. The t-test and F-test and the Kolmogorov-Smirnov statistics and Wilcoxon signed-rank test in the appendix show us that the mean and distribution of the project and non-project villages do not differ systematically, despite differences in the distribution of some variables. These observations support our belief that there are no major pre-existing differences between the project and the non-project villages.

Table 2 presents the basic statistics of this data from the second wave of the survey. We first note that, for the variables other than income and time spent fetching water, there is not much difference between the two waves of the survey. Table 4 presents the pairwise comparison of household incomes and the time spent fetching water in the second wave of the survey. On- and off- farm incomes both experienced large and statistically significant increases between the two waves. The time spent fetching water has significantly decreased.

Table 2: Basic statistics of treatment and control groups

Variable list	Mean		
	Treatment group (st. dev.)	**Control group (st. dev.)**	**Total (st. dev.)**
Number of household members (persons)	5.81 (1.93)	5.69 (1.96)	5.75 (1.95)
Household members over age of 60 years (persons)	0.66 (0.84)	0.68 (0.85)	0.67 (0.84)
Household members under age of 16 years (persons)	2.22 (1.39)	2.14 (1.41)	2.18 (1.39)
Household members with high school education or above (persons)	0.99 (0.91)	1.03 (0.92)	1.01 (0.92)
Household members with health insurance (persons)	0.91 (0.41)	0.93 (0.38)	0.92 (0.41)
The size of household's farmland (mu (15mus=1ha))	12.51 (10.98)	11.87 (10.11)	12.19 (10.98)
Net income from farming (RMB)	2062.26 (763.76)	1902.59 (826.48)	1982.43 (810.22)
Net income from livestock (RMB)	825.64 (918.77)	739.14 (988.53)	782.39 (871.49)
Net income from own business (RMB)	283.13 (140.78)	261.23 (153.27)	272.18 (128.83)
Income from off-farm work (RMB)	3458.12 (1123.98)	2928.23 (1261.75)	3193.18 (1176.85)
Household net income in the past year	6629.15 (2075.42)	5831.19 (2161.04)	6230.17 (2117.76)
The distance to fetch drinkable water (km)	0.1 (3.25)	1.25 (2.31)	0.62 (3.06)
The use of drinking water (tons/month)	5.2 (11.26)	5.82 (8.75)	5.51 (10.08)
Total cost of planting (RMB, including seeds)	985.65 (1061.21)	816.45 (1532.18)	861.55 (1722.65)
The use of water for agricultural purposes (tons/year)	148 (216.82)	135.2 (244.57)	141.55 (236.42)
The cost of water for agricultural purposes (RMB)	318.24 (365.16)	198.76 (216.42)	266.5 (273.52)

The distance to fetch water for agricultural purposes (km)	0.9 (3.64)	1.25 (2.19)	1.07 (4.24)
Total number of livestock raised (pig, cow and sheep)	12.37 (21.31)	10.55 (19.31)	11.53 (18.63)
Total number of livestock raised (rabbit, chicken, duck and goose)	46.73 (53.18)	20.52 (26.28)	34.21 (35.29)
Total labour hours spending fetching water (household head and wife, average)	0.93 (1.45)	1.46 (2.09)	1.19 (2.85)
Total labour hours spending on fetching water (children)	0.85 (1.92)	1.06 (1.29)	0.96 (1.86)
Whether all children attend primary and middle school (yes)	60%	64%	62%
Whether wife decides where to immigrate? (yes)	30%	40%	35%
Whether wife decides to buy durable good? (yes)	60%	52%	56%
Whether wife decides to send children school? (yes)	38%	42%	40%
Whether husband engages in taking care children? (yes)	8%	10%	9%
Household members contracted hepatitis or cholera or dysentery or typhoid (yes or no, %)	0.42 (0.53)	0.37 (0.48)	0.39 (0.47)

Source: Survey conducted by authors and local team

These statistics are again presented in three columns: treatment group, control group and both groups considered together. The average household size of 5.75 persons is slightly higher than in the previous year. The household age composition and the average number of persons educated at the high school level or above was stable over these two years. Health insurance coverage is 0.92 persons per family, slightly more than one year before. Farmland size also does not change by much. Households earn most of their incomes from off-farm rather than on-farm work. Net incomes from farming, livestock, self-employment and off-farm work rises significantly, especially for the treatment groups, and thus total household income does as well. Moreover, the average amount of labour time spent fetching water is also less than before, especially for the treatment group. Other variables such as the decision making power of women in households and the number of household members infected with hepatitis, cholera, dysentery or typhoid are similar to the ones we collected from the first wave of the survey.

Table 3 provides the pairwise test of those income variables between the treatment and control groups in the second wave of the survey. The t-test for differences in means between the treatment and control groups and the Kolmogorov-Smirnov statistics all suggest that households in the treatment group have greater average income both on- and off-farm than households in the control group.

Table 3: Pairwise test of incomes between the treatment and control group

Variable	t-test for mean	F-test for proportions	Kolmogorov-Smirnov statistics (P-value corrected)	Wilcoxon signed-rank test (prob>|z|)
Net income from farming	1.752	1.563	0.091	0.8732
Net income from livestock	0.827	0.652	0.187	0.1405
Net income from own business	0.592	0.379	0.283	0.4523
Income from off-farm working	1.872	1.426	0.074	0.3877
Household net income	2.128	1.726	0.066	0.052

Source: Survey conducted by authors and local team

Table 4 provides the pairwise test of labour allocations (time) between the treatment and control groups in the second wave of the survey. The t-test for mean, the F-test for proportions, the Kolmogorov-Smirnov statistics and Wilcoxon signed-rank test suggest that households from the treatment group allocate more time to both on- and off-farm activities than households in the control group.

Table 4: Pairwise test of labour allocations between the treatment and control group

Variable	t-test for mean	F-test for proportions	Kolmogorov-Smirnov statistics (P-value corrected)	Wilcoxon signed-rank test (prob>|z|)
Labour hours, on-farm	1.712	1.074	0.945	0.1738
Labour hours, off-farm	1.933	0.982	0.078	0.1187
Labour hours, fetching water	0.886	0.592	0.291	0.3736

Source: Survey conducted by authors and local team

Table 5 provides the pairwise test of children's school attendance between the treatment and control groups in the second wave of survey. The t-test for mean, the F-test for proportions, the Kolmogorov-Smirnov statistics and the Wilcoxon signed-rank test suggest that there is no significant difference in children's school attendance among households in the treatment group and those in the control group.

Table 5: Pairwise test of children's school attendance, treatment and control groups

Variable	t-test for mean	F-test for proportions	Kolmogorov-Smirnov statistics (P-value corrected)	Wilcoxon signed-rank test (prob>|z|)
Children school attendance	0.1892	0.7473	0.2875	0.3983

Source: Survey conducted by authors and local team

Table 6 provides the pairwise test of labour allocations between the treatment and control groups in the second wave of the survey. The t-test for mean, the F-test for proportions, the Kolmogorov-Smirnov statistics and the Wilcoxon signed-rank test suggests that there is no significant difference in health status between the treatment and control groups.

Table 6: Pairwise test of household health effects, treatment and control groups

Variable	t-test for mean	F-test for proportions	Kolmogorov-Smirnov statistics (P-value corrected)	Wilcoxon signed-rank test (prob>|z|)
Children school attendance	0.6458	0.8275	0.1985	0.2925

Source: Survey conducted by authors and local team

Given the fact that there is no significant difference in these variables of interest between the treatment and control groups in the first wave of survey, the above pairwise comparisons provide us with clear and strong evidence that water cellar projects have significant impacts on household incomes and labour allocations. In the following section, we will construct empirical models to investigate the strength of the impacts of the water cellar project in the selected subsample.

VI. Estimation of the impact of the water cellar project

With the data collected from these two waves of the survey, we are able to estimate the effects of the water cellar project. With these variables, for instance, we can run a simple "difference-in-differences" (DD) regression in which we consider women's income as the dependent variable and others as explanatory variables. Through the coefficient of the dummy variable "with or without water cellars", we can identify the impact of water cellars on women's income. Moreover, the repeated surveys allow us to compare, for instance, the growth rates of women's income between the control and treatment groups.

For instance, our estimation model is as follows:

$$s_{ivt} = \alpha w_v + \beta t + \delta w_v t + \eta H_{iv} + \mu X_v + \varepsilon_{ivt}$$

where s_{ivt} stands for the dependent variables of interest (household income) of household i in village v at time t (before and after the water cellar project was implemented); w_v is a dummy variable denoting whether locality v has a water cellar project; t is the time index (also a dummy variable); H_{iv} is the matrix of household characteristics (family size, total agricultural land held by the household, education level and so on); X_v is the matrix of village characteristics (local transportation and distance to regional capital). The coefficient δ captures the impact of the water cellar project. Given the differences in standard assumptions on the error term (ε_{ivt}) in the OLS, robust and cluster robust models, we will adopt a different estimation method.

The variables on the right-hand side of the model should not include the variables that could be affected by the water cellar project. As for household characteristics, we include the number of household members, household members with high school or above education, the size of farming land and the total number of hours spent fetching water (before installation of the water cellar). The village characteristics involve the distance required to fetch drinkable water, the distance to fetch water for agricultural purposes, the average cost of drinkable water and the average cost of water for agricultural purposes prior to water cellars being installed. The variables are not affected by the water cellar project itself.

We will estimate the simple OLS model, the robust model and the cluster robust model. Different from the OLS model, the robust model assumes that the error term is not identically distributed. We will also estimate the model using a village cluster robust model. The village cluster robust model further relaxes the OLS assumption and requires only that the observations be independent across the villages. The results we present here are the estimates from the village cluster robust model.

The estimation results on household income are presented in table 7.

Table 7: Estimation results, impact on household incomes

Variables \ Dependent variables	Household income	Income, farming (including livestock)	Income, off-farm	Income, own business
Number household members	0.79** (0.48)	0.51 (2.36)	0.37 (0.56)	0.64 (0.39)
Number members with high school education or above	1.34 (2.59)	0.14 (0.81)	0.36 (1.68)	-0.01 (0.87)
Total household farmland (ha)	0.35* (0.22)	1.64** (0.88)	1.14 (2.58)	1.15 (1.36)
The distance to fetch drinkable water	3.60 (4.3)	3.08 (4.33)	-0.72 (0.62)	-0.15 (0.36)
The distance to fetch water for agricultural purposes	1.61 (2.82)	1.03 (1.2)	0.26 (0.39)	0.11 (0.22)

Average cost of drinkable water	-1.08 （1.75）	-0.82 （1.19）	0.91 （1.36）	1.06 （1.21）
Average cost of water for agricultural purposes	1.25 （2.1）	1.29 （2.13）	0.80 （0.74）	-0.44 （0.55）
Total labour hours spent fetching water	3.56 （4.18）	2.01 （3.26）	0.72 （0.66）	-0.15 （0.28）
T	1.75** （0.96）	1.08* （0.69）	0.93** （0.48）	0.91* （0.58）
W	-0.81 (0.96)	1.53 （0.99）	-0.25 （1.83）	1.6 （1.09）
t*w	0.05*** （0.02）	0.09 （0.09）	0.04** （0.02）	0.03 （0.04）
Total cost of planting	3.27 (4.23)	1.82 （1.87）	1.41 （2.29）	2.56 （3.25）
Constant	1.53*** (0.38)	1.92* （1.03）	2.02* （1.24）	1.87 （0.99） *
R-squared	0.37	0.27	0.23	0.29
Number observations	2360	2360	2360	2360

Source: Survey conducted by authors and local team

The coefficients of the interaction terms between the time dummy and the water cellar project dummy in the household income and off-farm income equations are positive and significant. These results suggest that, compared to one year ago, household income in both control and treatment groups are significantly higher. The water cellar project significantly increases both total household income (4.6%) and off-farm income (3.1%) in the sample. Household size and the size of the household farmland are also positively and significantly related to both household income and income from farming in the equations. Moreover, the time dummy has a strong impact in all equations.

As we show that the water cellar project significantly increases households' incomes, we would like to know how this effect is transmitted. Therefore, we want to test whether the water cellar project increases the amount of labour time that women allocate to both on- and off-farm activities. To see these, we estimate the model where we simply consider women's on- and off-farm labour hours as dependent variables and treat the remaining variables (which are presumed to not be directly related to labour allocations) as independent variables. The results are presented in the following table.

Table 8: Estimation results, women's labour hours

Dependent variables / Variables	Farming labour hours (st. dev.)	Off-farm hours (st. dev.)
Number household members	-0.27** (0.14)	-0.22** (0.11)
Number members with high school education or above	1.12 (2.08)	0.33 (1.28)
Total household farmland (ha)	0.82*** (0.17)	-0.56*** (0.18)
The distance to fetch drinkable water	-0.85 (1.32)	-0.52 (0.41)
The distance to fetch water for agricultural purposes	1.06 (1.62)	0.36 (0.95)
Average cost of drinkable water	-1.28 (1.02)	0.93 (1.72)
Average cost of water for agricultural purposes	0.85 (1.18)	0.91 (0.94)
Total labour hours spent fetching water	-0.76** (0.38)	-0.35** (0.18)
T	0.95 (1.72)	1.05 (1.58)
W	-0.71 (0.68)	-0.15 (0.23)
t*w	0.02** (0.01)	0.04** (0.02)
Total cost of planting	2.17 (3.25)	1.51 (2.18)
Constant	1.58*** (0.48)	2.12* (1.54)
R-squared	0.45	0.33
Number observations	2360	2360

Source: Survey conducted by authors and local team

The results in table 7 show us that on- and off-farm labour supplies are negatively related with the number of household members. This is not surprising because women are commonly expected to spend more time caring for children and the elderly. The number of labour hours allocated to farming is positively related to the total area of household farmland, and we can similarly state that the number of labour hours supplied is negatively related to the size of farmland. This is not surprising because an expansion in the size of farmland can easily lead women to spend more labour on farming, and presumably thus less time in off-farm work. The interaction between the time and water cellar project dummies is positive in both the on-farm and off-farm income equations. This indicates to us that the water cellar project strongly and positively impacts both on- and off-farm income. However, the impact is greater on off-farm labour supply than on on-farm labour supply. These results confirm equations (5) and (6) in the theoretical framework where the water cellar project increases household incomes by effectively increasing the number of hours that women have available to allocate to labour by enabling women to increase their labour supply.

We are also interested in how the water cellar project improves children's school attendance rate. To see this effect, we regress the children's school attendance dummy on the dependent variables listed above by using a logit estimation model. The results are presented in table 9.

Table 9: Estimation results, children's school attendance

Dependent variables / Variables	Children's school attendance (st. dev.)
Number household members	-0.18 （0.13）
Number members with high school education or above	1.12 (2.15)
Total household farmland (ha)	0.42 (0.36)
The distance to fetch drinkable water	-0.65 （1.25）
The distance to fetch water for agricultural purposes	0.82 （1.32）
Average cost of drinkable water	-1.18 （0.92）
Average cost of water for agricultural purposes	0.58 （0.85）
Total labour hours spent fetching water	-0.56 （0.39）
T	0.88 （1.09）
W	-0.76 (0.86)
t*w	0.03 （0.04）
Total cost of planting	2.86 (3.28)
Constant	1.85** (0.84)
Pseudo R-squared	0.18
Number observations	2360

Source: Survey conducted by authors and local team

The results show us that the water cellar project does not significantly increase children's school attendance. We are also interested to know how the water cellar project improves household health conditions. To check this effect, we regress the children's school attendance dummy on the dependent variables listed above using a logit estimation model. The results are presented in table 10.

Table 10: Estimation results, household members contracting hepatitis, cholera, dysentery or typhoid

Dependent variables / **Variables**	**Household members contracting hepatitis, cholera, dysentery or typhoid**
Number household members	-0.15 (0.11)
Number members with high school education or above	0.82 (1.25)
Total household farmland (ha)	0.51 (0.39)
The distance to fetch drinkable water	0.05 (1.95)
The distance to fetch water for agricultural purposes	0.22 (1.02)
Average cost of drinkable water	2.08 (1.99)
Average cost of water for agricultural purposes	0.52 (0.95)
Total labour hours spent fetching water	0.76 (0.99)
T	0.68 (1.19)
W	0.26 (0.66)
t*w	0.05 (0.09)
Total cost of planting	-2.76 (3.18)
Constant	1.58* (0.94)
Pseudo R-squared	0.08
Number observations	2360

Source: Survey conducted by authors and local team

The result shows us that the water cellar project does not significantly reduce the likelihood that household members contract hepatitis, cholera, dysentery or typhoid.

We check the robustness of the results by adopting the quantile regression method. Unlike the simple OLS model, a quantile regression fits ordinary linear regression and is concerned with predicting the median rather than the mean. The quantile regression method therefore provides a certain verification of robustness of our basic results by excluding outlier observations. We run the quantile regression on income as represented in the equations. The results are shown in the following table 11.

Table 11: Estimation results, household income (quantile regression)

Variables \ Dependent variables	Households' income	Income, on-farm (include livestock)	Income, off-farm	Income from own business
Number household members	0.85*** (0.43)	0.51 (2.19)	0.35 (0.55)	0.65 (0.42)
Number household members with high school education or above	1.28 (1.88)	0.17 (0.85)	0.43 (1.55)	-0.02 (0.88)
Total household farmland	0.39** (0.21)	1.69** (0.86)	1.29 (2.49)	1.23 (1.42)
The distance for fetching drinkable water	3.65 (4.18)	3.18 (4.22)	-0.84 (0.75)	-0.23 (0.35)
The distance to fetch water for agricultural purposes	1.82 (2.75)	1.02 (1.13)	0.28 (0.37)	0.14 (0.25)
Average cost of drinkable water	-1.24 (1.53)	-0.83 (1.04)	0.88 (1.26)	1.18 (1.37)
Average cost of water for agricultural purposes	1.36 (2.17)	1.29 (2.56)	0.84 (0.71)	-0.46 (0.58)
Total labour hours spending fetching water	3.66 (4.09)	2.33 (3.54)	0.75 (0.62)	-0.17 (0.26)
T	1.89*** (0.92)	1.17** (0.65)	0.91*** (0.46)	0.93* (0.57)
W	-0.91 (0.73)	1.48 (0.97)	-0.24 (1.28)	1.62 (1.15)
t*w	0.07*** (0.02)	0.09 (0.06)	0.05*** (0.02)	0.05 (0.04)

Total cost of planting	3.56 (4.13)	1.75 （1.89）	1.44 （2.38）	2.52 （3.17）
Constant	1.64*** (0.35)	1.97*** （0.83）	2.02** （1.14）	1.89** （0.92）
R-squared	0.38	0.31	0.33	0.35
Number observations	2360	2360	2360	2360

Source: Survey conducted by authors and local team

The results of the quantile regression provides us with a robust estimation of the impact of the water cellar project. Compared with the results from the OLS estimates, the coefficients of the interaction between the time and water cellar dummies are greater and more significant. Based on these estimates, we show that the water cellar project increases households' total income and off-farm income by 5.6% and 4.2%, respectively.

VII. Conclusion

We performed two waves of the survey, one prior to and one after implementation of the water cellar project. In the report, we have presented the statistics in relation to variables covered by surveys providing the data for this evaluation. We have also verified that our sample selection is not biased. Our estimation results suggest to us that the water cellar project significantly increases household income and also women's labour supply in both on- and off-farm work. The water cellar project does not induce a statistically significant difference in children's school attendance or household health conditions.

Our results indicate that the water cellar project plays an important role in alleviating poverty. Given the fact that many parts of western China are among severe drought areas, where more than 20 million people are heavily affected, the project should not only rely on donated funds collected from an NGO and we suggest that the government should become involved in projects like the water cellar project, such as through the provision of additional funds. Furthermore, governments should hire technical people who are able to provide technical support, such as by choosing appropriate locations of water cellars, by designing pipe lines connected to residents' houses, by dealing with leakages of collected water and by testing water quality.

In order to alleviate the poverty effects of water shortages, in particular in the Ningxia Hui autonomous region, the relevant levels of government should also provide multiple and/or overlapping policies to direct public resources into similar such projects. For instance, governments should also provide some training for on- and off-farm work. Following expanded labour supply as a result of the water cellar project, the government can then provide job training programs to improve labourers' chances of finding a job. In addition, the water cellar project in most cases only provides water resources for living. Hence, the government should have some complementary projects that allow households to have more water supply for their agricultural work. That is important for alleviating poverty. However, it must be kept in mind that there are no silver bullets in poverty alleviation.

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Appendix: The questionnaire

"Land of Love, Water Cellar for Mothers" Survey

Interviewer: **Supervisor:**

Start Time of Interview:______________ **End Time of Interview:______________________________**

Name of Household Head:__________

Name of Respondent: ________ **Relationship to Head:______________** **Phone #________________**

Note: Household Members include household head, spouse, unmarried children, and other members living with the household head if they eat together.

A: Basic Demographic Information For Each Household Member

Table A-1: Basic Information of all household members.

	1 household head		2 spouse of household head		3		4		5		6		7		8	
(1) Relationship to household	NA		NA													
(2) Age																
(3) Gender																
(4) Ethnicity (see code)																
(5) Occupation																
(6) Place of birth																
(7) Place of hukou																
(8) Status of hukou																
(9) Marriage status (see code)																
(10) Communist Party member? (If Yes, year joined party)																
(11) Are you a primary laborer on the farm?																
(12) Education level (see code)																
(13) Number of years studying full-time at each level of schooling and rank within cohort at that level. (For each household member – First)																
Primary school																
Middle school																
High school or equivalent																

College and above								
(14) Current residence(if other than village of interview)								
(15) Total number of paid off-farm working months within home county in 2009								
(16)Total number of paid off-farm working months outside home county in 2009								
(17)Do you own a cell-phone?								

Note: Maximum number of household members is eight. If exceeded, drop the youngest ones.

A-2: The source of drinking water of the household.

The source of drinking water (water cellar, river, other)	The distance to fetch water (km)	Time spent fetching water (hours/day)	Measurement of the water (tons/month)	Cost if any (RMB)

B: Land, Farming, and Livestock

Note: Questions in this section are for the whole household. Unless otherwise noted the time frame is between 1 August 2009 and 31 July 2010.

B(I): Farming and forestry activities.

B1. Do you currently have land for cultivation?

(1) Yes (2) No

B2. Please fill in the following table, B-1, regarding the major crops harvested during the timeframe defined above:

Table B-1: Basic information regarding major crops harvested in the timeframe defined above

	Plot 1		Plot 2		Plot 3						
	Crop1	Crop2									
(1) Size of planted area (mu)											
(2) Yield (half kg)											
(3) Percentage sold (%)											
(4) Price (RMB / half kg)											
(5) Cost (RMB), including: Seeds											
Fertilizers											
Pesticides											
Single use agricultural tools											
Irrigation costs											
Taxes and fees											

Rental costs of agricultural machinery											
Others											
(6) The source of non-rain water for agricultural purposes											
Surface water (tones/year)											
Water cellars (tones/year)											
Time fetching water (hrs/day)											
(7) Natural Disasters (Y/N)											
Including											
Flood											
Fire											
Disease(s) or Pest Infestation											
Others_______											
(8) Reduction in yield (Y/N)											
If Yes, then: yield reduction (half kg)											
Loss in income (RMB)											

Note:

(1) You must include plots that have major crops, while private land with vegetables grown only for self-consumption need not be included.
(2) Types of crops grown on each plot are not listed; the interviewer needs to fill this in appropriately.

B(II): Livestock, Herding, Fish husbandry and Other Non-Farming Activities

B3. **Please fill in the flowing table, B-3, about livestock**:

Table B-2: **Livestock activities**

	(1) Quantity raised	(2) Percentag e sold	(3) Income from selling (RMB)	(4) Cost (RMB)						(5) Animal disease	
				Baby livestock	Fodder	Medicine	Fence repair	Water source and cost	Others	Quantity dead (type of diseases)	Loss in income
Pig											
Cow											
Sheep											
Rabbit											
Chicken											
Duck											
Goose											
Fish											
Shrimp											

Note:

(1) In "(1) Quantity Raised", do not include animals that have not yet produced any economic benefit.
(2) In "(3) Income from selling" include the income earned from selling babies and eggs of animals.

B(III): **Individual/Household business**

B4. Does anyone in your household run an individual business (such as a grocery store, restaurant, hotel, taxi service)?

(1) Yes
(2) No □ If No, skip to part C

B5. Net (after tax) income from the business last year? ___ RMB (If contracted, deduct the contract fee paid to the owner of the business)

C: Off-farm work

C1.Are any household members employed off-farm?

(1) Yes (This includes household members not currently employed IF they live outside of the home county)
(2) No □ If No, skip to D

C2. Please fill in the following table, C-1, about household members currently working off-farm.

Table C-1 basic information regarding household members working off-farm

Household member code										
(1) Number of jobs held last year										
(2) Number of times individual returned home last year / total travel expenses for returning last year.	Trips	RMB	Trips	RMB	Trips	RMB	Trips	RMB	Trips	RMB
Answer the following questions: If the household member held more than one job last year, answer the following for the current job or the most recent job if not currently employed.										
(3) Place of work (province, city, county)										
(4) Date job started (year, month)										

(5) Is he/she still employed in this job?					
If not, when did the job end (year, month)					
Reason for job termination					
(6) Average monthly salary					
(7) Monthly consumption (RMB)					

Note: *Household member codes should be consistent with those in table A-1.*

English note: *This table is filled in only for "farmers." In general this means that only those with a rural hukou status will answer this table.*

D： Other income and labor allocation

D1. In addition to the household income reported in parts B and C, what other income, if any, did your household have in the previous year? Please fill in the following table, D-1, regarding other cash income for household members.

Table D-1：Other Cash Income of Household members

	1 Household head	2 Spouse of household head	3	4	5	6	7	8	Household (cannot be separated)
(1) Other incomes source (RMB per month)									

D2. Please fill in the following table, regarding time allocation of labor:

Table D-2: Time allocation of labor

The head of household		The spouse of the head of household		Children		Others if any	
(1) Type of labor use	(2) Hours allocated	(1) Type of labor use	(2) Hours allocated	(1) Type of labor use	(2) Hours spending	(1) Type of labor use	(2) Hours spending

E: Children's education

E1. Were any members of the household in school last semester (2007/3-6), not including adult education? (1) Yes (2) No

□If No, skip to F

E2. Please fill in the following table, E-1, regarding children's education:

Table E-1: Basic information regarding children's education in the previous semester.

Household member code	(1) Schooling level	(2) School	(3) Ranking within cohort			(4) Total educational expenditure	(5) Percentage of costs financed by (%) (see code)						
			Above average	Average	Below average		1	2	3	4	5	6	7

Note: *Household member codes should be consistent with those in table A-1. Fill in code for (1) see appendix. For (2) fill in the name of the school the person attends. Codes for (5) are also listed in the appendix.*

F: Health

Note: *This section includes all household members. The interviewers need to measure the height and weight for household members that are present.*

F1. Fill in the following table, F-1, regarding diseases and waterborne diseases:

Household member code	Diseases in recent three years			
	Type of diseases	Duration	Expenditure in cure	Cure or not
1				
2				
3				
4				
5				
6				
7				
8				

Village local characteristics

Province______
City_____
Average temperature in summer _____ in winter_____
Average rainfall____
Whether there was a disaster in three preceding years____; what kinds of disasters_____
Total population____ Total number of household members____
Income per capita ____
Distance to the major city_____
Distance to nearby river____; Distance to other water resource____
Distance to the highway closed by____; Distance to the other types of transportation____
Whether there is a local women's organization_____